

SOLAR PANEL MAINTENANCE SYSTEM

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ABSTRACT

This paper is mainly based on cleaning and cooling of solar panel. The main intention is to clean the dust particles deposited on the top of solar panel and cool the panel to increase conductivity by automatic maintenance system. In order to enhance the efficiency. This panel can be cleaned automatically.

KEYWORDS: solar panel, automatic, cleaning, cooling, dust

INTRODUCTION

Energy is the one of the major issues that facing world, the supply of energy has been major problems. The sun emits solar energy at huge rate so there is abundant availability of solar energy in the nature. Solar energy can be converted to many usable energy forms through solar panel and other solar equipments. Solar power has become a source of renewable energy & its applications should be enhanced.

If all solar energy could be transformed into usable forms then it would be more enough to satisfy the world's energy demand. However, this is not possible because of different natural changes and conditions in nature such as effect of clouds, dust, temperature and other wastes by living things, solar panels are commonly employed in dusty environments. The dust gets accumulated on the surface of the panel and blocks the incident light from the sun, that reduces the power generation potential of the panel. So in order to avoid this, cleaning system has been designed in order to improve the efficiency of solar panel. This is done automatically by sensing the reduction of nominal energy production of solar panel and cleaning of the solar panel surface by mechanical procedure and cooling the panel by thermal cooling system.

Traditionally cleaning of solar panel was performed manually by individuals. This type of cleaning had disadvantages like risk of accidents and damage of the panels, poor maintenance difficulty in access to panels etc. The automatic panel maintenance system is implemented to overcome these problems in the traditional cleaning and even enables the effective, non- abrasive cleaning and avoids the Inefficient production of energy due to the deposition of dust and thermal heating.

SYSTEM DESIGN

First, system is classified into two modes one is manual and another one is automatic mode. In manual mode individual has to control the cleaning device manually by using controlling device like bluetooth module. Here in this paper HC05 module has been used for manual control.

- **Manual Control**

In manual mode the solar panel is cleaned by manual commands passed by the user or an individual through Bluetooth module which is transmitted to the mechanical moving brushes and spraying of cleaning liquid. The temperature of the solar panel is being sent to the Bluetooth device of the user spontaneously and displayed in led display.

- **Automatic Control**

In this mode the solar panel is maintained in an intelligent way by sensing the dust and waste accumulated on the solar panel by using special IR sensors. Temperature of the solar panel is obtained by using LM35 temperature sensor. When the efficiency is decreased due to this the mechanical brushes are automatically turned on and the thermal cooling system are activated. And even timers are used for cleaning solar panel every day of use in the morning. LDR is used for switching on and off of the system during day and night.

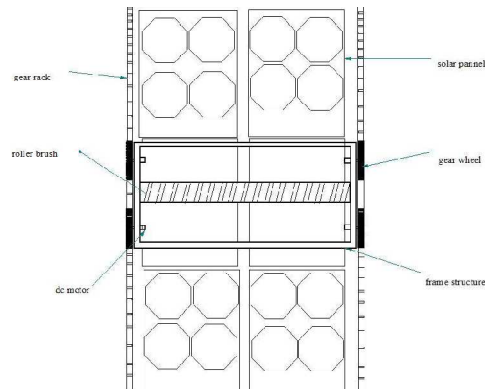


FIGURE 1: TOP VIEW OF CLEANING SYSTEM

As shown above in the figure 1 the system has a roller brush and which is fixed to a dc motor that moves from top to down and vice versa. This movement cleans the panel thoroughly and before this movement the washing liquid is sprayed along the panel surface for effective cleaning.

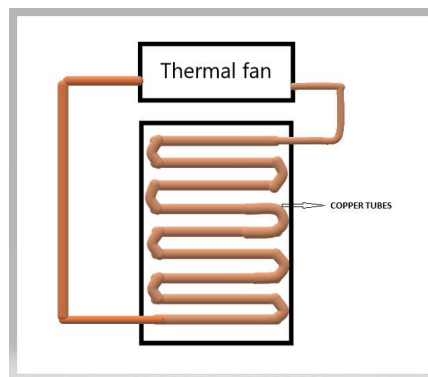


FIGURE 2: BACK VIEW OF SOLAR PANEL

SYSTEM DESIGN FLOW

In the below figure represents how the program flow of the system works ,as shown below user have the control over the system using android device or any other Bluetooth device. At first the user need to give the switch on command next the option is selected weather the system need to be controlled by the user or automatically be monitored by the system.

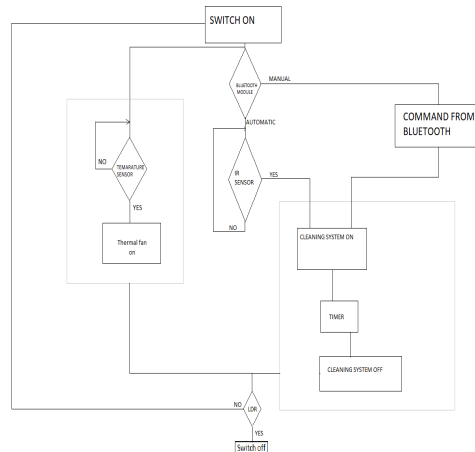


FIGURE 3: SYSTEM DESIGN FLOW

First, manual mode the system cleaning on and off is controlled by user its made on when the user observe the dust on the solar panel which can reduce the efficiency, but the temperature sensor are automatic once the system is turned on therefore temperature is maintained at particular threshold temperature which is not harmful of the panel efficiency.

Automatic mode, in this the user need to select the option as automatic after the system is turned on. In this the sensors are used for monitoring the dust and other particles.

STEPS

1. Switched to automatic mode
2. IR sensor sense the dust
3. If yes the cleaning system is turned on
4. Else the loop keeps on running until the dust is sensed.
5. During this the temperature sensor LM35 sense the temeperature.
6. If temperature exceeds particular threshold the thermal fans are made on which in turn connected to the copper coils turned across the panel below.
7. These function of the system are on in the daylight and in night kept off which is controlled by the LDR present in the system.
8. Timer is used which cleans the system every start of the day.

BLOCK DIAGRAM

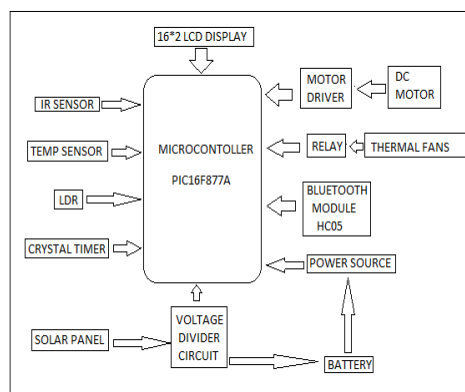


FIGURE 4: BLOCK DIAGRAM

Mainly the system consists of microcontroller PIC16F877A, INFRARED sensor, LM35 temperature sensor, light dependable resistor, motor driver , relay , thermal fans ,Bluetooth module HC05.

ADVANTAGES

1. Reduce manual assistance.
2. Low maintenance cost.
3. Working principle is quiet easy.
4. Reduce risk to human life.
5. In automatic mode it works without human interface in even remote areas.

CONCLUSIONS

- Existing automatic cleaners mainly focus about huge arrays and in common are unsuitable for installing on smaller arrays particularly residential roofs. For those with limited space this means that a smaller array only needs to be installed, hence our idea serves as a huge advantage for those smaller sites.
- The development of cooling and cleaning system can solve the problems and improve the efficiency of solar panels.
- This helps in using renewable energy source and maintaining the atmosphere as it is pollution free and It is an ecofriendly concept.
- It is an innovative technology and reduce the human interface.

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